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Midwifery and Nursing Strategies to protect against COVID-19 During the Third Trimester of Pregnancy

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ABSTRACT

Objective: The rapid pace of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic (COVID-19) presents significant challenges to midwives and nurses. This study aimed to explore midwifery and nursing interventions to limit the transmission of COVID-19 among women in their third trimester of pregnancy, to reduce the incidence of nosocomial infection and promote safety of care for women and their infants.

Method: We completed a retrospective review of medical records from 35 women in their third trimester of pregnancy with SARS-CoV-2, admitted to one hospital in Wuhan, China in January and February 2020. We investigated the clinical characteristics of the COVID-19 infection in pregnancy, and the individualized midwifery and nursing care offered, including environmental protection, prevention of nosocomial infection, maternal observations, monitoring of signs and symptoms of COVID-19, and psychological care.

Result: Thirty-one women had a caesarean section, and four had vaginal births. Retrospective analysis of midwifery and nursing strategies implemented to care for these women showed no maternal complications or nosocomial infections.

Conclusions and implications for practice: The care strategies we implemented could prevent complications and nosocomial infection in the third trimester of pregnancy, thus ensuring the safety of women and their infants. Further research needs to determine treatment priorities for women infected with COVID-19 during pregnancy and the postnatal period.

Introduction

In December 2019, an outbreak of COVID-19 was first reported in Wuhan, Hubei Province, China. At the end of January 2020, the World Health Organization (WHO) announced COVID-19 was a public health emergency of international concern (PHEIC) (WHO, 2020b, Huang et al., 2020). On March 11, 2020, WHO officially declared that COVID-19 had become a pandemic (WHO, 2020a).

COVID-19 was a novel and poorly understood coronavirus—SARS-CoV-2, which could rapidly lead to lower respiratory infections. Even asymptomatic patients presented abnormal lung computerized tomography (CT) features (Shi et al., 2020). As pregnant women are susceptible to respiratory pathogens and severe pneumonia (Council, T. S, 2020) we decided to explore midwifery and nursing treatment regimens, and outcomes for pregnant women with COVID-19 and their infants.

In this study, we retrospectively collected and analyzed midwifery and nursing data from 35 pregnant women in their third trimester of pregnancy admitted to one hospital in Wuhan in January and February, 2020, with a diagnosis of COVID-19 with a view to informing guidance for caring for pregnant women infected with COVID-19.

Methods

Epidemiological Data

Following first reports of COVID-19 in Wuhan, Hubei Province, China, in December 2019, outbreaks were reported across Hubei Province and other parts of the country (Zhu et al., 2020). On January 23rd, 2020, Wuhan, as the initial center of the epidemic, was shut down entirely and quarantined. Despite these measures, the epidemic contin-

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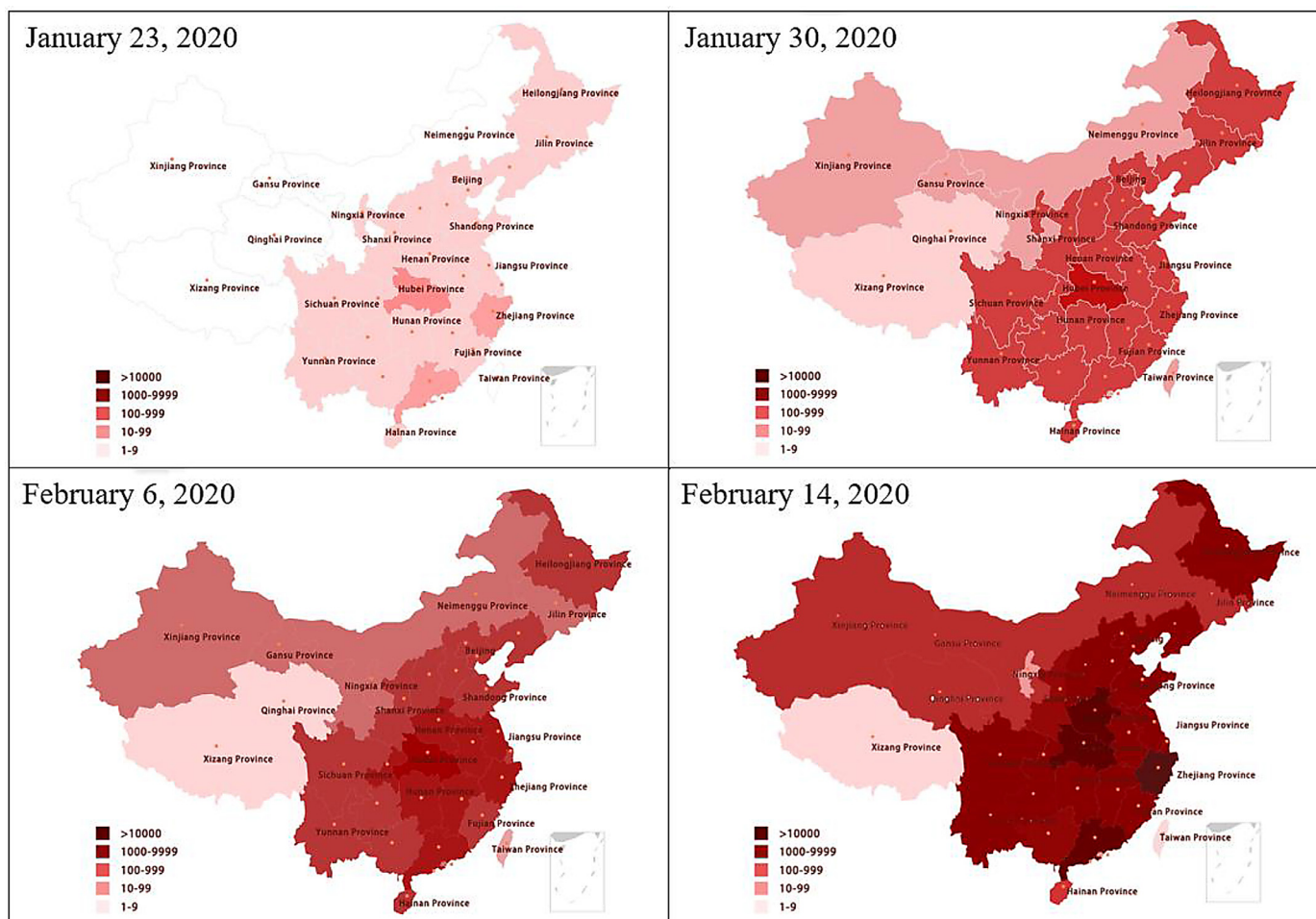


Fig. 1. Distribution of new coronavirus pneumonia.

used to develop rapidly. The number of confirmed cases increased from 572 to 55,525 by February 14th, 2020. The distribution of the novel coronavirus pneumonia in each province is shown in Fig. 1, and the epidemic trend in Fig. 2.

Clinical Data

During January and February 2020, thirty-five women in the third trimester of pregnancy with COVID-19 in Wuhan were admitted to our hospital. We confirmed cases according to diagnostic criteria in the New Coronavirus Pneumonia Prevention and Control Program (5th Edition) published by the National Health Commission of China.

Women were aged from 24 to 40 years, and gestational age at admission ranged from 31 weeks plus 6 days to 40 weeks plus 2 days. Several women had pre-existing morbidity. At admission, four women had a history of hepatitis B, two women had gestational diabetes, one woman had gestational hypertension, one had severe pre-eclampsia, one had intra-hepatic cholestasis in pregnancy, one had placenta previa, one had uterine fibroids, one had a fatty liver, and one had influenza. Premature rupture of membranes occurred in eight women, intrauterine distress in four women, and polyhydramnios in two women.

Eighteen of the 35 women had fever ranging from 37.4°C to 38.8°C, including two cases of postpartum fever. Other symptoms of COVID-19 included five women who had a cough, three had myalgia, two had sore throats, and fatigue and one case of diarrhea. Sixteen patients (45.71%) had no clinical manifestations. All women had abnormal lung CT results.

Midwifery and Nursing Measures and Recommendations

Management of the Maternity Ward

As not all pregnant women with clinically confirmed COVID-19 presented with fever or other clinical symptoms, it was essential to maintain a high degree of vigilance and follow strict hygiene, disinfection, and isolation protocols when caring for the women (Moore and Rendall, 2014, Qin et al., 2017). All the procedures described in this paper are based on best practice.

We observed procedures as follows: (1) Ward layout: Antenatal and postnatal wards were divided into three distinct areas—clean, potentially polluted, and contaminated—with two access points—one for women and one for medical staff. Signs were prominently posted in each isolation area to remind staff to keep all doors closed, to practice meticulous hand hygiene, disinfect door handles, and keep rubbish bin lids closed at all times. (2) Ward ventilation: ward areas were ventilated at least twice a day, for at least 30 minutes each time, with windows opened to let in fresh air if this was possible. (3) Disinfection care: Clinical staff strictly adhered to SARS-Cov-2 disinfection and isolation guidelines, including disinfecting all equipment and floors, and complying with isolation and transfer protocols for women, equipment, and when sending specimens (intra and inter-departmental). Disposable supplies were used when available. Stethoscopes, infusion pumps, sphygmomanometers, thermometers, and other items used for multiple patients were disinfected frequently. (4) Medical waste (including pa-

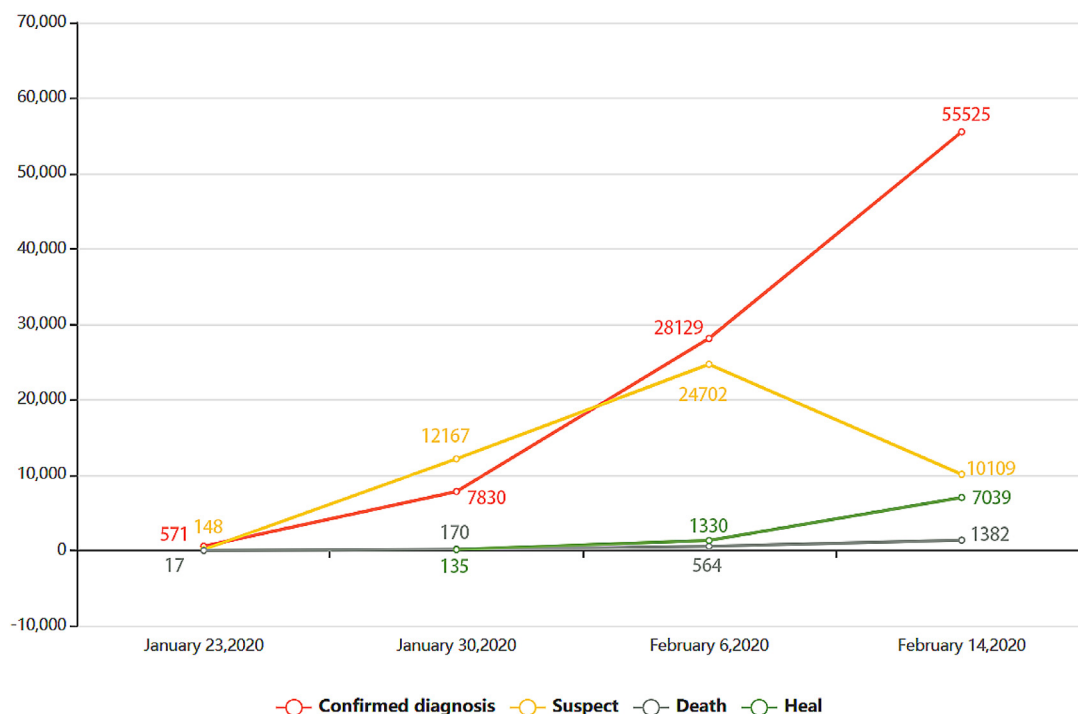


Fig. 2. Growth of new coronavirus pneumonia.

tient domestic waste) was clearly marked and collected and handled following specified procedures.

Protecting Clinical Staff Against Infection

From January 23rd, 2020, the medical officer and head of infection control began conducting weekly nosocomial infection training for each department. All training was conducted in accordance with the New Coronavirus Pneumonia Prevention and Control Program (5th Edition) published by the National Health Commission of China and hospital plans for COVID-19 prevention (NHFPC, 2020). To improve caregiver vigilance and protection against infection, training focused on hand hygiene (Ragusa et al., 2018), use of personal protective equipment, respiratory hygiene, prevention of needle stick injuries, cleaning of medical supplies, treatment of medical waste, air and surface disinfection, and management of pregnant women with COVID-19. If caring for someone with a suspected or confirmed case of COVID-19, it was essential to perform droplet and contact isolation. A full-time nosocomial infection manager was responsible for supervising daily nosocomial infection prevention work, such as air, surface, and ground disinfection and sterilization, strict disinfection of reusable items, and supervision of clinical staff hand hygiene. This manager also supervised the hospital cleaners in how to disinfect items and to comply with comprehensive disinfection policies.

Infection Prevention for Pregnant Women and Accompanying Persons

Generally, in China, there are numerous visitors to a pregnant woman in hospital. To avoid SARS-Cov-2 transmission, it was extremely important to quarantine pregnant women with confirmed or suspected COVID-19. Given the necessity, one uninfected family member was allowed to accompany the woman.

During hospitalization, women were managed as follows: (1) In suspected or confirmed cases women were placed in single rooms, and asked not to leave the ward, with contact between other in-patients minimized. (2) Women and their family members were asked to wear surgical masks and pay attention to cough etiquette while hospitalized.

(3) Women’s urine, fesces, and vomit were handled according to strict guidelines.

For women with COVID-19 in the third trimester of pregnancy, the main clinical manifestations included low-grade fever, accompanied by cough, myalgia, sore throat, and diarrhea. Of note is that symptoms appeared more likely to rapidly develop into severe sequela after giving birth (Council, 2020.02.03), although the timing of onset of this varied. This meant that women were observed strictly during and after pregnancy, with regular monitoring of vital signs, including oxygen saturation, temperature, and gastrointestinal symptoms. It was imperative to monitor drug efficacy and side effects and provide oxygen support as needed. It was also crucial to regularly monitor the fetal heart. Additionally, we advised women to monitor and report their symptoms, including (1) changes in bowel movements; (2) frequency or changes in fetal movements; (3) vaginal bleeding, other vaginal loss; and (4) respiratory symptoms: such as dyspnea. Any changes in the women’s health were communicated with medical staff immediately.

Management of Infected Pregnant Women

It is important to monitor a woman’s temperature in order to better manage the disease. If the fever was below 38.5°C, physical cooling was recommended. If over 38.5°C, in our unit, the woman’s doctor prescribed, for example, non-steroidal anti-inflammatory drugs, and the woman’s temperature was checked again after 30–60 min of administration, with her fluid intake and electrolyte balance monitored (Bichovsky et al., 2019). If the woman was perspiring heavily and/or vomiting, her peripheral circulation was monitored to avoid dehydration and other complications, such as convulsions and shock.

Respiratory Care

Close attention was paid the respiratory status of infected pregnant women, such as cough frequency, sputum properties, and signs of dyspnea. Midwives and nurses should encourage women to perform deep breathing, help them turn, and perform regular chest percussion sessions to loosen lung congestion and increase the woman’s ability to clear sputum. Women with severe disease were given oral expectorants, in-

halants, and suctioning, if necessary, making sure that clinical staff used level-three protection during these procedures.

Consequently, all 35 pregnant women received appropriate midwifery and nursing care, and no severe complications, such as acute respiratory distress syndrome (ARDS) and respiratory failure were noted.

Treating Other Symptoms

If women had diarrhea, stool characteristics were closely monitored and women used a personal toilet. They were prescribed antidiarrheal drugs and antibiotics to prevent repeated diarrhea which could facilitate the spread of the virus.

It was important to address women's anxieties, and women reporting severe fatigue were encouraged to increase their indoor activities, maximize nutrition, and get adequate sleep.

Daily Care

On admission to the hospital, pregnant women with COVID-19 were strictly isolated, and only one family member was allowed accompany them. This was usually the woman's partner.

Postnatal Management

Breastfeeding

Guidance to date recommends that pregnant women with confirmed or suspected COVID-19 should be quarantined for 14 days. As postpartum physiological breast engorgement, with or without mild fever, can potentially increase a woman's anxiety levels it is crucial to offer effective support. This should include information, for example on how to correctly latch the baby to commence breastfeeding and how to identify possible sequelae associated with delaying breastfeeding, including early signs of mastitis and when to seek treatment. Women who wish to breastfeed after they have been found to be clear of the virus should be taught how to maintain lactation by hand or breast pumps.

Breast milk is the best food source for premature and full-term newborns (Nojiri et al., 2020, Johnston M, 2012) and previous studies have found no evidence of SARS-Cov-2 in the breast milk of infected women (Chen H, 2020), however SARS-Cov-2 can be transmitted through droplets and contact. Guidance for women using breast milk banks includes: (1) strict implementation of hand hygiene, and wearing of medical-surgical or N95 masks while collecting milk. (2) The collected breast milk can be sterilized by pasteurization, ultraviolet disinfection, high-pressure sterilization, and other sterilization methods. Although the pasteurization changes the composition of breast milk to varying degrees, it will not impair the nutrients required to support the growth of the newborn (Kanaprach et al., 2018, Israel-Ballard et al., 2006). (3) Breast milk should be sealed and frozen after sterilization.

Preventing Postpartum Complications

Midwives and nurses need to monitor onset of postpartum complications. This should include monitoring of vital signs, estimate the amount of postpartum bleeding, maintaining wound care and keeping the woman's skin dry. The woman's temperature should be regularly monitored as should her respiration rate, uterine involution and vaginal loss. Women should be closely monitored for acute respiratory distress syndrome, septic shock, and acidosis.

Psychological Care

In addition to the general psychological stress caused by COVID-19, pregnant women are likely to more anxious about the risk of infection to their infants which could be associated with symptoms of postpartum depression (Aaron et al., 2015). It is important to monitor women's psychological health and ensure she is offered relevant information. This could include: (1) updated information about COVID-19: including latest progress and treatment methods, answering important questions about breastfeeding for women and their families; (2) discuss isolation protocols: explain quarantine procedures for the woman, which could

Table 1

Summary of case reports based on case definition reporting system.

Patient Information(N=35)	Number	Percentage (%)
Epidemiological history	35	100%
Symptom		
Fever	18	51.43
Cough	5	14.29
Myalgia	3	8.57
Sore throat	2	5.71
Fatigue	2	5.71
Diarrhea	1	2.86
No symptom	16	45.71%
Complications of pregnancy		
GDM	2	5.71
ICP	1	2.86
Severe preeclampsia	1	2.86
Gestational hypertension	1	2.86
Placenta Previa	1	2.86
Intrauterine distress	4	11.43
Premature rupture of membranes	8	22.86
Pregnancy with uterine fibroids	1	2.86
Polyhydramnios	2	5.71
Pregnancy with hepatitis B	4	11.43
Scar uterine pregnancy	3	8.57
Pregnancy with fatty liver	1	2.86
Pregnancy outcome		
Cesarean delivery	31	88.57
Vaginal birth	4	11.43
Neonatal outcome		
Apgar score		
Normal	35	100.00

help them to cooperate with the staff and reduce psychological pressure induced by the wearing of special protective gear and other requirements; (3) emphasize positive information: discuss the woman's birth experience and updates on the health of her infant, to help women understand the progress and treatment of the disease, reduce fear, and increase confidence; (4) enhance communication: encourage women to interact with their relatives and friends, for example using WeChat, which can alleviate loneliness; (5) offer psychological counseling and intervention: provide online psychological communication channels for women and their families.

Postnatal Education

It is important to remind women of the need for continued isolation and treatment after discharge and how to access online resources for mental health support. When it comes to self-isolation, women and their families were advised to stay indoors, wear a mask when going out, wash their hands frequently, and open windows for ventilation for 30 minutes at least twice a day. Family members should go to their nearest hospital immediately if they present with clinical features of COVID-19, such as fever, fatigue, and a dry cough.

Pregnancy and neonatal outcomes following confirmed COVID-19 infection

In our study, 31 women had a caesarean section due to obstetric indications, and four women had a vaginal delivery. All infants had normal Apgar scores at birth. (see [Table 1](#)). Although it was recommended that all infants should be tested for viral nucleic acid using a newborn throat swab, eight of the 35 babies did not receive the test because their parents did not give permission. Fortunately, all test results were negative, except for one suspected case, which was retested which resulted in a negative result.

Evaluation of midwifery and nursing care of pregnant women with confirmed COVID-19 infection

We implemented targeted environmental care, strict disinfection and isolation measures, guidance on breastfeeding, and postpartum care, to prevent women from developing nosocomial infection and postpartum

complications. Evaluation of adherence to midwifery and nursing protocols included: the quality and safety of midwifery and nursing care, accurate maintenance of medical records, adherence to disinfection and isolation procedures, ward management, patient records, and use of protective measures. Our evaluations showed high compliance with all recommended procedures.

Discussion

COVID-19 is a highly contagious, acute disease of the respiratory tract, with a long incubation period. Pregnant women are susceptible to viral respiratory infections and will respond with a dramatic inflammatory reaction, and rapid disease progress once infected (Paquette et al., 2015, Chen SH, 2020.02.09). All 35 women with SARS-Cov-2 infection admitted to our unit gave birth with no complications or nosocomial infections.

SARS-Cov-2 is mainly transmitted via respiratory droplets or close personal contact with someone infected although it is still unclear if the virus can be transmitted through the digestive tract or airborne droplets. One recent study showed that the median incubation period for SARS-Cov-2 was 3–24 days and that patients with confirmed and asymptomatic COVID-19 were the sources of infection (Guan et al., 2020). As the virus is highly contagious (Guo et al., 2020), it is particularly important to identify and diagnose early in order to control the disease in pregnant women (Liu et al., 2020, Schwartz, 2020). There were diverse clinical manifestations of COVID-19 in our population, many of whom were asymptomatic when diagnosed. We all need to be alert to women's symptoms and vital signs as well as consider her surrounding environment.

Special precautions are required for preventing nosocomial infections and promote patient safety (Wang et al., 2020b, Cabrini et al., 2020). Nosocomial infections not only delay the recovery of infected patients, but could spread infection among medical staff or uninfected patients. According to a recent survey, midwifery and nursing staff are responsible for approximately 30% to 50% of nosocomial infections (Van et al., 2020). This means we should strictly control every facet of women's care to reduce the incidence of nosocomial infection and promote patients' recovery.

None of the 35 pregnant women in our series progressed to severe disease, such as acute respiratory distress syndrome (ARDS), septic shock, metabolic acidosis, or bleeding and coagulation dysfunction. Despite SARS-Cov-2 sharing more than 85% homology with SARS-like coronavirus in bats, it is reasonable to speculate that the progress of COVID-19 is similar to that of SARS, including progression to severe disease (Chan et al., 2020). It is therefore essential to closely monitor infected pregnant women and manage symptoms aggressively as they arise. Any changes in the fetal heart rate should be monitored and emergency measures instituted as necessary to maintain the health of women and infants.

Although the clinical manifestations of COVID-19 infection in pregnant women are similar to patients in the general population, we should adhere to specific midwifery and nursing guidelines, including support for breastfeeding and prevention of postpartum complications. The rapid spread of COVID-19 poses a challenge to guidance and support for breastfeeding. One recent study showed that the virus test was negative in the postpartum milk of infected pregnant women (Chen H, 2020), while another study showed a substantially lower level of the virus in various cell types at the maternal-fetal interface, indicating that maternal-fetal interface may lack SARS-Cov-2 receptor ACE2, preventing vertical transmission of the virus from mother to fetus (Zheng QL, 2020.02.20). Of note is that our study was limited to a relatively small number of women in their third trimester of pregnancy and findings may not apply to women in the first and second trimesters of pregnancy. Additionally, guidelines recommend that pregnant women with suspected or confirmed COVID-19 infections must be quarantined for 14 days post birth, and breastfeeding stopped until two consecutive

viral nucleic acid tests with a sampling interval of at least one day are negative and relevant clinical symptoms have disappeared. Clinical staff should provide guidance to women on breastfeeding.

Psychological care is even more important during this pandemic (Wang et al., 2020a). Symptoms of anxiety and depression may increase in infected women during the postpartum period (Duan and Zhu, 2020), who may exhibit varying degrees of mental health problems. One report of public awareness and attitude towards new coronavirus pneumonia among 3165 respondents in the general population showed that 98.54% of respondents expressed a high degree of fear, and 94.45% were worried about themselves or their family members being infected (Qi Yi, 2020.02.11). Studies have shown that over half of respondents who experienced mental health problems in previous public health emergencies had a strong need for psychological intervention (Fang et al., 2020, Abdelaziz et al., 2020, Chan and Huak, 2004).

In summary, pregnant women with COVID-19 may experience a range of psychological issues including: (1) fear of COVID-19, (2) concerns regarding the vertical transmission of the disease from mother to child, (3) anxiety and depression caused by isolation from their newborns and the inability to breastfeed, and (4) physical discomfort caused by diet and environmental restrictions. Midwifery and nursing staff should be aware of the potential psychological issues that may arise in pregnant women with suspected or confirmed COVID-19, and offer timely psychological counseling, while midwifery and nursing management of women with COVID-19 depends on the individual situation and specific needs of each patient. We should highlight practical measures, such as preventing and reducing care-related complications and nosocomial infections, ensuring adequate care for infected pregnant patients, and ensuring the safety of all participants—mothers, infants, and medical staff. Although the women we have described were in their third trimester of pregnancy, our observations and recommendations could be followed for women in the first and second trimesters of pregnancy, to prevent coronavirus-related complications and optimize outcomes for women and their infants.

Author contributions

JuanLiu, and Yuming Cao made substantial contributions to the study concept and design. Yuming Cao was in charge of the manuscript draft. Juan Liu, ChengXu, Chunhua Zhou took responsibility for obtaining written consent from patients, obtaining ethical approval, and Jing Yuan confirming data accuracy. WeiWei made substantial contributions to data acquisition, analysis, and interpretation. YuanJing, LiqunKang, ChengXu, and WeiWei were the nurse care of the pregnant women, and were responsible for data collection and confirmation. WH and FL were in charge of the laboratory tasks, including sample processing and detection. XinLan Qu made substantial revisions to the manuscript.

All persons who have made substantial contributions to the work have reported in the manuscript, including those who provided editing and writing assistance are named in the acknowledgments section of the manuscript and have their written permission to be named.

Ethical Statement

This study was reviewed and approved by the Medical Ethical Committee of Zhongnan Hospital of Wuhan University (approval number 2020004).

Declaration of interests

We declare no competing interests.

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